MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

PMT0101 – MATHEMATICS I

(Foundation in Information Technology)

27 FEBRUARY 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 6 pages with **FIVE** questions.

2. Attempt **ALL** five questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided. All necessary working steps **MUST** be shown.

4. **No calculators are allowed**.

No calculators are allowed.
You are required to write proper steps.

Question 1 [10 marks]

a) Simplify the expression and write your final expression as a fraction with positive exponents.

$$\frac{\left(2a^{\frac{2}{3}}b^{-1}\right)^3}{2ab^{-1}}$$

(2 marks)

b) Rationalize the denominator for $\frac{\sqrt{2}-3}{3+\sqrt{2}}$ and simplify. (2 marks)

c) Simplify the expression $\frac{x^3-64}{x-4}$ to the lowest term.

(3 marks)

d) Given a complex number, $z=\frac{4i}{4+3i}$.

i) Express z in the form $a+bi$, where a and b are real numbers.

ii) Find the conjugate of z, denoted as $\overline{z}$.

(3 marks)

Continued ...

Question 2 [10 marks]

a) A quadratic equation $2x^2 + (2+h)x + 2 = 0$ has exactly one real solution. Find the values of h.

(2 marks)

b) i) Solve the inequality $\frac{x+5}{x-1} \leq 0$.

Show clearly your Sign Diagram and give your final answer in interval notation.

ii) Hence, find the domain of $h(x) = \sqrt{\frac{x+5}{x-1}}$.

Give your final answer in interval notation.

(3 marks)

c) i) Find the value of $|3 - \pi|$. Leave your answer in terms of π.

ii) Solve the equation $|x - \pi| = 3$.
Leave your answer in terms of π.

(2 marks)

d) Solve the equation $\sqrt{15 - 2x} = x$. Remember to check your answers.

(3 marks)

Continued ...

Question 3 [10 marks]

a)

i) Use long division to find the quotient and remainder when the polynomial $P(x)=3x^3-7x^2+4$ is divided by $(x-2)$.
You are required to state clearly what the quotient and the remainder are.

ii) Factorize completely $P(x)=3x^3-7x^2+4$.

iii) Solve $P(x)=0$.

(5 marks)

b) Given a polynomial function $f(x)=(x+2)^2(x-1)^2(x-4)$.

i) What is the degree of f?

ii) Find the zeros of f and their multiplicities.
At each zero, determine whether the graph of f crosses or touches the x-axis .

iii) Find the y-intercept of the graph of f.

iv) Determine the end behavior of f.

v) Sketch the graph of the function f.
Make sure your graph shows all intercepts and exhibits the proper end behaviour.

(5 marks)

Continued ...

Question 4 [10 marks]

a) Diagram 1 shows a relation in the form of a set of ordered pairs.

$$\{(3, 1), (5, 3), (4, 5), (6, 5), (5, 11)\}$$

Diagram 1

i) Find the image of 3.

ii) Write down the domain of the relation.

(1 mark)

b) Given the functions $f(x)=\sqrt{x-3},\ x\geq 3$ and $g(x)=x^2+5$.

i) Evaluate $(f\circ g)(2)$.

ii) Find $f^{-1}(x)$.

iii) State the domain and range of f^{-1}.
Leave your answer in interval notation.

(4 marks)

c) The graph of a function $f(x)=\ln(x-k)-1$ passes through the point $(3,\ -1)$.
Find the value of k.

(2 marks)

d) Solve the equation $2^{2x+3}=16$.

(1 mark)

e) Given $\log_3 x=2-3\log_3 y$, express x in terms of y.

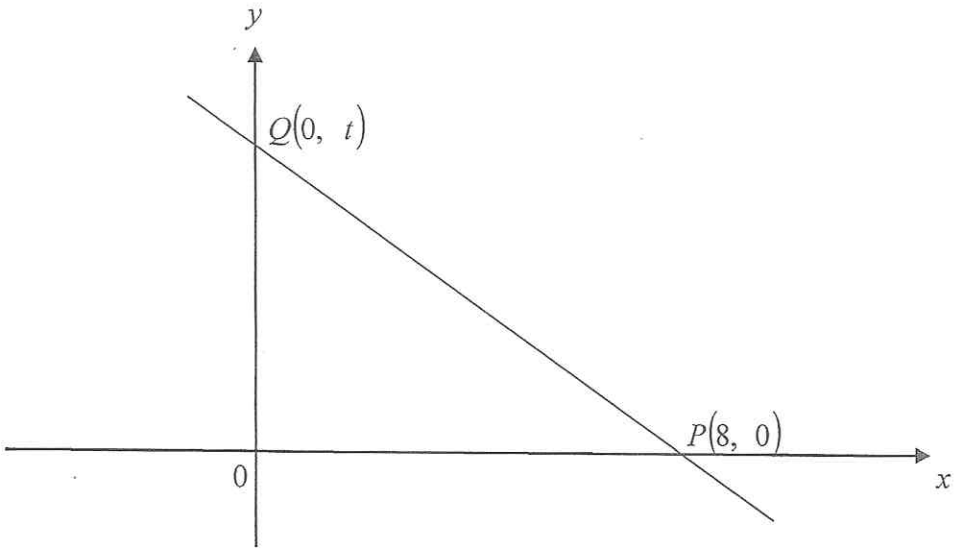
(2 marks)

Continued ...

Question 5 [10 marks]

a) The diagram below shows a straight line PQ that has an equation $\frac{x}{8}+\frac{y}{t}=1$ with slope $-\frac{1}{4}$.

PQ intersects the x-axis at point P and intersects the y-axis at point Q.



i) Find the value of t.

ii) Find an equation of the straight line that passes through P and is **perpendicular** to PQ.

Leave your answer in the form $y=mx+b$ where m is the slope and b is the y-intercept.

iii) A point T lies internally on the line PQ such that $QT:TP=2:1$.
Find the coordinates of point T.

iv) A point $S(x,\ y)$ moves such that its distance is always 5 units from point P. Find an equation of the locus of S.

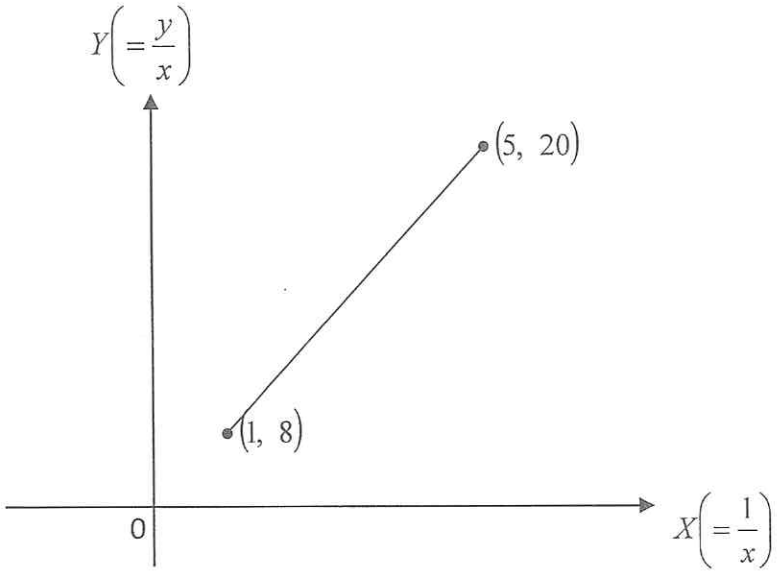
Express your final answer in the form $x^2+y^2+bx+cy+d=0$ where b, c and d are real numbers.

(6 marks)

Continued ...

b) Two variables x and y are related by an equation $y = pq + px$, where p and q are constants.

The diagram below shows a straight line obtained after plotting $Y\left(=\frac{y}{x}\right)$ against $X\left(=\frac{1}{x}\right)$.



i) Find the slope and the Y-intercept of the line.

ii) Find the values of p and q.

(4 marks)

End of Page.